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THE MUSHROOM GROWERS'
ASSOCIATION

MGA
BULLETIN

JANUARY, 1956 · NUMBER 73

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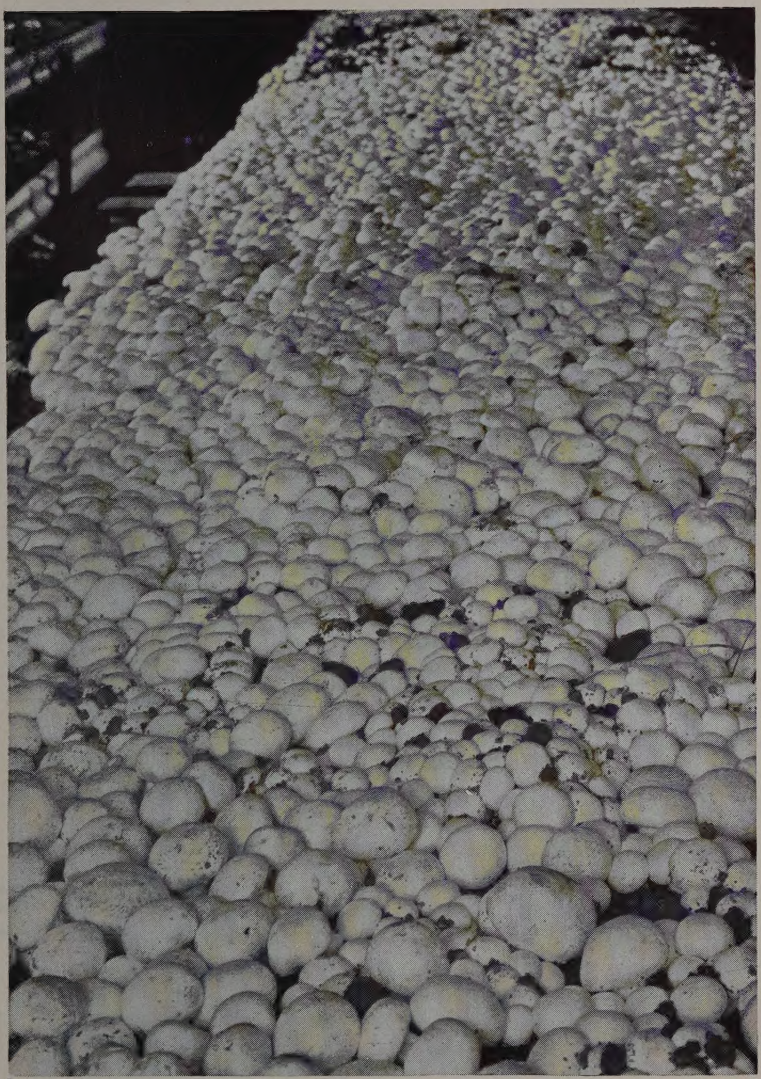

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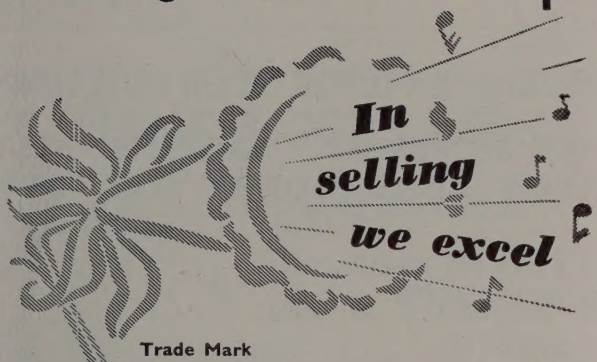

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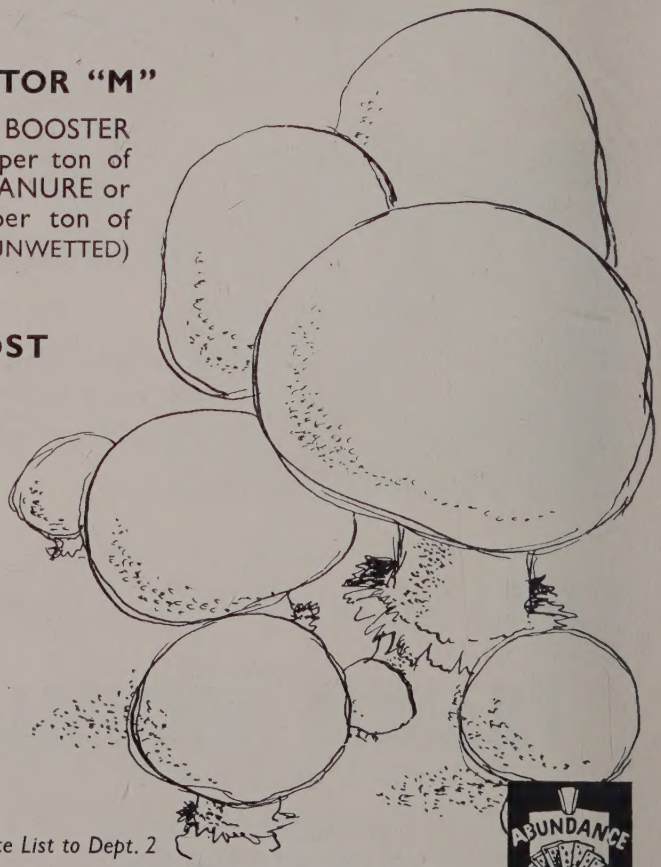

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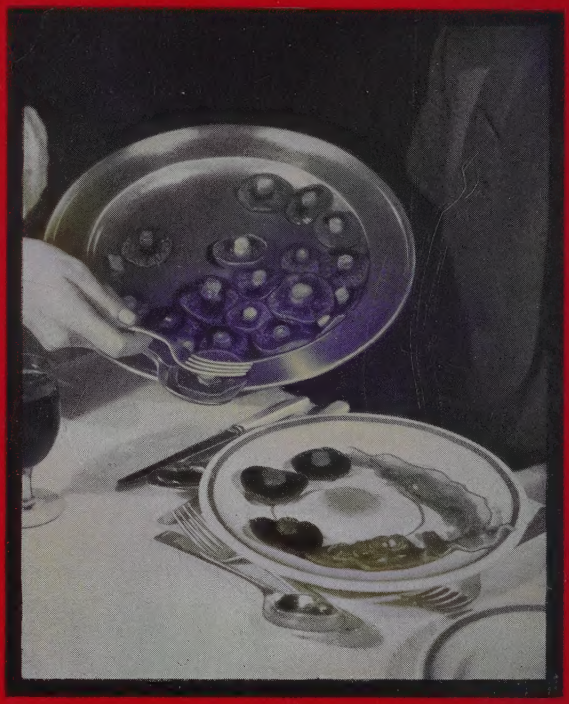

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The
MGA BULLETIN

JANUARY, 1956
NUMBER 73

EDITORIAL

SPAWN RESEARCH

Production is now rising! At any rate, that is my forecast for the next three months, and that is the New Year hope of the Editorial Board. Let's try and forget 1955 . . . . . .

The principal article in this January issue focusses attention once again on the importance of Spawn.

A number of European spawn-makers were invited recently by the Danish Research Station to submit samples for co-ordinated productivity trials. Of the seven spawns received, the best averaged more than 3 lb./ft., and the worst less than 2 lb. The fact that they were all brown strains and were weighed complete with " roots " is by the way.

Now comes a valuable American contribution to the same branch of study. We hope it will stimulate growers to pay due regard to the importance of their choice of spawns.

An objection which some may raise is the anonymity of the spawns tested. It should be realised that the purpose of the trials was not publicly to advocate a named product. There would be a number of objections to that, not the least of which concerns the Law.

For example, it has long been known in France, and now we are beginning to realise it, that each grower should test different strains one against the other *under his own growing conditions*. No one spawn crops equally in every environment, as readers of Sarazin's series will know.

It was, incidentally, particularly pleasing to the Editorial Board that we were given the first option to publish this latest paper because, to quote the authors, " it is our opinion that the *MGA Bulletin* has a much wider distribution among people actively engaged in the various aspects of mushroom research and production than any other single publication." FRED. C. ATKINS.

Footnote: *The Editorial Board was thanked at Brighton for "quietly and efficiently" watching over this Bulletin. What praise there is should properly go to Winston Alderton. We merely express an opinion when it is asked for, and really do precious little.*

Mushroom Strain Evaluation Studies

By
ELDROW REEVE & WAYNE A. ROBBINS
Campbell Soup Company, West Chicago, Illinois

It is generally accepted that all mushrooms cultivated in the United States belong to one species, *Agaricus campestris*. The brown, cream, and white mushrooms are considered to be varieties or strains of *A. campestris*. **Kligman** (1), **Sarazin** (2) and **Sinden** (3) have reported differences in rate of growth, appearance and productivity of mushroom spawn selected from monosporus isolates of *A. campestris*. They indicate that by proper selection it is possible to obtain fast growing and high producing strains.

Since spawn makers obtain spores for propagation from selections of individual mushrooms it is expected spawn prepared from the various selections would exhibit differences in yield and growth behaviour. Although the experience of commercial mushroom growers strongly supports the findings of **Kligman, Sarazin** and **Sinden,** there are no published records of objective spawn evaluation trials. The purpose of this paper is to present the results of three spawn strain trials conducted over a 3-year period.

Procedure

The trials herein reported were all conducted in modern commercial mushroom houses at West Chicago, Illinois, and included brown and white strains from each of three commercial spawn makers. Each spawn was replicated six times in randomized two-span (43 square feet) plots. The plots were picked daily from date of first picking to date of final picking, and the mushrooms weighed and counted. The recorded yield weights are all on the basis of good sound mushrooms with stems trimmed to fresh U.S. market specifications. A record was also made of the number of mushrooms that died prematurely, and with exception of trial 1, a record was obtained on the incidence of *Mycogone perniciosa*. In this report the terms dead and premature dying refer to mushrooms that distinctly formed on the beds but died before reaching a marketable size. The term diseased refers exclusively to mushrooms parasitized by *Mycogone perniciosa*. Sound mushrooms refers to trimmed marketable mushrooms. A brief history of each trial is summarized in **Table 1.** It will be noted yields of the white strains from sources A and B were comparable, but highly significantly superior to those from source C. Likewise, increases in yield of white strains from sources A and B over the respective brown strains were of such magnitude as to be highly significant. The yield of source B brown was significantly greater than that from source A brown.

All white strains were considerably smaller in size than the brown strains. Only about one-half as many mushrooms of the brown strains were required to make a pound as of the whites. Source B whites were smaller than the whites from either source A or C. The size of all brown strains was the same.

Table 1. Brief History of Spawn Strain Trials

Trial 1—Spring, 1950

Beds filled with race track compost	1st March, 1950
Beds spawned with grain spawn	8th March, 1950
Beds cased	16th March, 1950
First picking	6th April, 1950
Last picking	17th June, 1950

Trial 2—Winter, 1951

Beds filled with race track compost ..	27th February, 1951
Beds spawned with grain spawn	7th March, 1951
Beds cased	16th March, 1951
First picking	7th April, 1951
Last picking	29th June, 1951

Trial 3—Winter, 1952

Beds filled with race track compost ..	14th November, 1951
Beds spawned with grain spawn ..	22nd November, 1951
Beds cased	3rd December, 1951
First picking	24th December, 1951
Last picking	18th February, 1952

Results

In order that the three makers of spawn used in these studies may remain anonymous they are herein designated as sources A, B and C.

Trial 1. The harvest data from trial 1 are summarized in **Table 2.**

Table 2—Summary of Harvest Data—Spawn Variety Trial 1

Source of Spawn	Yield* lb./sq. ft.	Size No. mush./lb.	No. dead mush./sq. ft.	% of total mush. sound
A—white ..	2·491	23	11	86
B—white ..	2·440	26	13	83
C—white ..	1·982	23	6	88
B—brown ..	1·964	13	30	46
C—brown ..	1·788	13	20	53
A—brown ..	1·715	13	22	50
Least difference required for 5%	0·247	1	7	
significance 1%	0·334	2	10	

*The yield weights are on the basis of good sound mushrooms with stems trimmed to U.S. fresh market specifications

It will also be noted in **Table 2,** that premature dying of the mushrooms was much more severe with the brown strains than with the whites, regardless of source. Of the total number of mushrooms picked from the whites 83-88 per cent. were sound, whereas only 46-53 per cent. of those picked from the browns were good. The severity of premature dying was significantly higher in source B whites and browns than in the respective strains from sources A and C.

Trial 2. The harvest data from trial 2 are presented in **Table 3.**

Table 3—Summary of Harvest Data—Spawn Variety Trial 2

Source of Spawn	Yield* lb./sq. ft.	Size No. mush./lb.	No. dead mush./ sq. ft.	No. diseased mush./sq. ft.	% of total mush. sound
A—white	2·230	31	6	1	92
B—white	2·104	34	7	4	91
A—brown	2·026	21	23	7	65
B—brown	2·021	22	20	10	69
C—white	1·905	31	6	2	92
C—brown	1·590	21	13	17	72
Least difference required for 5%	0·191	3	5	8	
significance 1%	0·259	4	7	11	

*The yield weights are on the basis of good sound mushrooms with stems trimmed to U.S. fresh market specifications

The yield from source A white was significantly higher than that from source B white, which in turn was higher than source C white. The increase in yield from source A white over that obtained from source C white was of such magnitude as to be highly significant. Yields from source A and B browns were comparable and highly significantly superior to source C brown.

Trial 3. The harvest data from trial 3 are summarized in **Table 4.**

Table 4—Summary of Harvest Data—Spawn Variety Trial 3

Source of Spawn	Yield* lb./sq. ft.	Size No. mush./lb.	No. dead mush./sq. ft.	No. diseased mush./sq. ft.	% of total mush. sound
B—white	1·581	24	9	3	76
A—white	1·571	26	8	4	78
B—brown	1·375	14	14	6	49
C—white	1·235	26	6	2	80
C—brown	1·173	15	14	4	49
A—brown	1·158	14	13	6	47
Least difference required for 5%	0·185	2	5	3	
significance 1%	0·251	3	7	4	

*The yield weights are on the basis of good sound mushrooms with stems trimmed to U.S. fresh market specifications

The size of all white strains was the same, as was the size of all brown strains. However, the white strains were much smaller than the browns. The white strains produced significantly fewer dead and in general fewer diseased mushrooms than did the brown strains.

As in trials 1 and 2, mushroom yields obtained from sources A and B whites were significantly higher than that obtained from source C whites, and higher than the browns from all three sources. Source B brown significantly outyielded source A and C browns. All white strains were smaller in size and in general produced fewer dead and diseased mushrooms than the browns.

Discussion

The white strains from three sources were almost indistinguishable in gross morphology. Likewise, the brown strains from sources A and B were very similar in appearance, while the brown strain from source C was characterized by short stalky stems and scaly caps with ragged edges. In general, spawn from source C was slower to start production than spawn from either source A or B. Similarly the brown strains were slower than the whites in coming into production. Of particular interest was the marked difference between the brown and white strains in the number of pinheads that formed but failed to develop into mature usable mushrooms. This is one attribute that should be carefully considered in a mushroom strain testing and development programme.

Since the spawn used in these studies was prepared on grain by the respective vendors whose preparation procedures may have varied slightly, it may not be valid to completely ignore the possibility that method of preparation may have exerted some influence on yield and growth behaviour. However, **Kligman's** studies (1) indicate that the behaviour of strains is not fundamentally altered by the substrate on which the mycelium is propagated. Thus, it is perhaps valid to ascribe the major differences observed in these studies to the genetical characteristics of the strains tested.

Summary

1. Of the commercial mushroom strains tested, superior yields and growth behaviour were obtained from the white strains. White strains from two sources consistently out-yielded a white strain from a third source.

2. All white strains were considerably smaller than the brown strains tested and produced fewer dead and diseased mushrooms.

3. Premature dying was a particularly serious attribute of the brown mushroom strains tested.

Literature Cited

1. Kligman, A. M. Some cultural and gentic problems in the cultivation of the mushroom, *Agaricus campestris* Fr. *American Journal of Botany*, 30: 745-762. 1943.

2. Sarazin, A. Cultures monospermes *d'Agaricus campestris* var. cultivee. *Comp. Rend. Acad. Sci.* (Paris) 208: 2015-2017. 1939.

3. Sinden, J. W. Pennsylvania Agricultural Experiment Station Bulletin 352, Annual Report, 1937.

OTHER FUNGI? NO!

Fred. Atkins replies to Martin Austin

Once upon a time the *MGA Bulletin* used to run the euphemistically titled Mutual Aid Section wherein many asked questions to which few attempted answers. In the same fine burst of proselytism some of us rushed regularly into print to endorse, argue or reject the contentions of contributors to the *Bulletin's* pages.

Some took our criticisms amiss. We who founded the MGA had never intended this. Being keen growers we assumed all would love an argument, and in those early days we did not pull our punches, eagerly seeking lively controversy. We expected, we almost demanded, retaliation; but it rarely came.

My own view is that Stanley Middlebrook stopped writing his remarkable Diary solely because no one ever rose to his bait, no one ever contradicted him, no one ventured an adverse opinion . . . . . in print, I mean.

These observations are prompted partly by the welcome reappearance in our columns of that sterling Don Quixote, tilting against the frightful machinations of spawn-makers, sundriesmen and market salesmen! Partly also by the publication of M. D. Austin's article in September *Bulletin* 69 (p. 727).

Martin Austin asks why we do not grow some of the other edible fungi. Why not experiment along these lines? he asks. Why not a fleeting glance at the possibilities of a greater range of edible fungi production?

I am astonished that he is such a stranger to " the literature." Has he not read Dorothy M. Cayley's pre-war work on this very problem, in which she had some success with the Haystack Mushroom? At very much the same time he was establishing himself as the Aubrey Thomas of the British Mushroom Industry, down at Wye, and could scarcely have overlooked Miss Cayley's studies.

In 1949, Mrs. Matthew Pinkerton reported in the *MGA Bulletin* on a Hogganfield assessment of the practical possibilities of cultivating the Morel, after discarding the Haystack Mushroom (because it would not travel well and was not an improvement, from any angle, on our *Psalliota hortensis*) and the Oyster Mushroom (because the logs on which it grows would be scarcer than horse-manure). The Japanese grow the *Cortinellus shiitake* on a very big scale; but again we have not an unlimited quantity of timber for its propagation, nor perhaps the climate.

The Morel would seem to be the most likely fungus to consider, despite its strange appearance. E. B. Lambert told us nearly 20 years ago that several investigators had attempted to grow it, with varying degrees of success. " The spores are easy to germinate. The mycelium grows vigorously in many autoclaved media . . . . . Sclerotia are frequently formed, but no one has attained more than sporadic success

in the production of fruiting bodies . . . . . It would seem probable that a fertilization phenomenon is one of the requisite factors for Morel fructification."

In other words, some preliminary experimentation has been done on bringing the Morel under cultivation. What would it cost to continue that research until it could be grown with a reasonable chance of success?

Sugihara and Humfeld were able to obtain pea-size growths of fungi such as Morel, Chanterelle, Wood Blewit, Honey Fungus and Shaggy Parasol Mushroom in liquid media in a manner similar to the commercial production of penicillin, but the flavour generally bore little resemblance to that of the wild parent. The growth of pellet Morels has been reported from Syracuse University . . . . . .

These are possible developments of flavouring and soup-making commodities, but not what Martin Austin has in mind, I imagine. And I do not consider them legitimate fields for the investment of mushroom growers' profits.

Our objective is the economic cultivation of *Psalliota hortensis*, and in the past ten years we growers have contributed £20,000 to finance research into just a few of a multitude of associated problems. Is this the moment to launch into new fields? Having made an enormous capital investment in mushroom buildings, despite a frightening and crippling ignorance of many fundamental factors, who among us could afford to plunge into the unlimited expense of research into quite a new set of problems related to the cultivation of other fungi for which no economic demand exists?

First let us do one job properly. We want answers to a hundred questions. What makes mycelium fruit? Is peat the final answer to the casing problem, or merely the first hesitant step away from disease-ridden soil? Are we going to give up the fight against nematodes and Cecid larvæ and Phorid flies? Are we content to surrender to Mummy, Truffle and La France?

If we could produce more mushrooms by reducing the ravages of pest and disease and by re-examination of our orthodox practices, we might then, by investing in publicity, be able to maintain our profit differential.

Let us earmark the next 25 years for our own fungus. It is one of the very best, both as aliment and condiment. The potential demand is almost untapped.

Let us not dissipate our energies on a study of strange growths which appeal to a commercially-negligible minority of mycophagists.

1956 EXHIBITION—EASTBOURNE

Provisional arrangements have been made for the 1956 Annual Mushroom Industry Exhibition to take place at Eastbourne, on Wednesday and Thursday, 14th and 15th November.

Reprinted with the Author's permission from the *PLANT DISEASE REPORTER* Volume 39, No. 11, dated 15th November, 1955.

MAGNESIUM IN MUSHROOM CASING SOIL

By E. B. LAMBERT AND T. T. AYERS

(*U.S. Dept. of Agriculture Research Service*)

Most mushroom growers in the United States use limestone to neutralize the acid soil normally used to case or top-layer the mushroom beds. Commercial ground limestone may vary in its content of magnesium carbonate from 1 to 45 per cent. This lack of uniformity in limestone has raised the question of the possibility of a yield reduction due to the toxic effect of a high magnesian limestone.

Sinden and Kligman have expressed somewhat different views on this question. Sinden is apprehensive of a high magnesium content in casing soils and has been credited with stating, " Soils of high magnesium content when used for casing mushroom beds delay production of the crop and may reduce total yields by half. The exact limits of this effect have not been determined. Use of high-magnesium lime for adjusting the acidity of casing soil should be limited to soils which are naturally low in magnesium. Several cases of severe injury to mushroom beds have been reported where this precaution was not observed."[1]

Kligman[2] on the other hand, believes there is little risk from neutralizing casing soil with limestone high in magnesium carbonate and stated, "Although magnesium is a toxic element in high amounts, the quantity incorporated in the soil for liming purposes is insufficient to cause an injurious effect. There is evidently no preference between pure limestone and one containing large amounts of magnesium carbonate."

In view of these differences of opinion and recommendations, the experiments discussed here were made to throw some additional light on the question of possible toxicity of magnesium in the casing soil. In these tests 10 different lots of Chester Loam casing soil were prepared by adding ground limestone from two different sources in amounts of 0, 2, 7, 10, and 20 per cent. of the moist weight of the soil. One of the limestones contained 33 per cent. magnesium carbonate and the other 1 per cent. Trays cased with these soils were prepared for yield tests as previously described.[3] The experiment was arranged in a randomized block design with six replicates.

[1]Anon. 1949. Penn. Agricultural Experiment Station *Bulletin* 515, 62nd Annual Report, p. 29.

[2]Kligman, A. M. 1950. *Handbook of Mushroom Culture*, Lancaster, Pa.

[3]E. B. Lambert and T. T. Ayers. 1952. An Improved System of Mushroom Culture for Better Control of Diseases. *Plant Disease Reporter* 36: 261-268.

Table 1. Effect on yields of adding to the casing soil different amounts of limestone with high and low magnesium content

Type of Limestone	Yield in pounds per square foot with limestone added as follows:			
	% 2	% 7	% 10	% 20
High magnesium (33% magnesium carbonate) ..	4·1	3·9	4·0	3·8
Low magnesium (1% magnesium carbonate)	4·1	3·9	3·8	3·8

The mean yields obtained from trays cased with different soil and limestone mixtures are shown in Table 1.

It is apparent that there was no difference in yield due to various amounts of magnesium in the limestone mixed with the soil. Also the quality of the mushrooms did not change nor was there any difference in the time of appearance of the first mushrooms on the trays. The fact that yields were not lowered after adding 20 per cent. of high magnesium limestone to the soil, would seem to be especially significant since limestone added at this rate supplies at least 10 times as much as normally would be required to neutralize casing soil.

The total magnesium oxide equivalent of the soil, after adding 20 per cent. of high magnesium limestone, was about 4 per cent. on a dry weight basis. This is approximately 3 per cent. more than most soils contain and about 1 per cent. more than soils with very exceptionally high magnesium content.[4] Growers adding the usual 2 per cent. of limestone would be adding only about 0·6 per cent. of magnesium oxide equivalent to the dry weight of the soil even though the magnesium carbonate content of the limestone may be as high as 45 per cent. This would raise the magnesium oxide equivalent of most top soils to less than 2·5 per cent. and of those few soils with exceptionally high magnesium content to less than 3·5 per cent. Both these levels are considerably lower than the 4 per cent. in one of the soil mixtures of our experiments. Moreover, it is probable that soils with exceptionally high magnesium content would not require neutralizing.

Our experiments lend support to Kligman's view that mushroom growers need not be concerned about the proportion of magnesium carbonate in limestone used for neutralizing casing soil that has been derived from the top 6 inches of a well developed soil profile.

[4]C. F. Marbut. 1935. Soils of the United States, *Atlas of Amer. Agr.*, Part III, U.S. Dept. of Agr.

Footnote:

Dr. Lambert writes to F. C. Atkins (21.10.55): "*Our conclusions on the magnesium content of soils may not apply to English conditions, especially when subsoil is used for casing. However, I was interested in learning that the crushed rock used for casing in France contains about 2% magnesium oxide equivalent.*

STANLEY MIDDLEBROOK'S

PINHEADS

35. Through some mistake the following Christmas Greeting was not despatched to all sane growers:

God rest you merry, Gentlemen, let nothing you dismay,
And nor it needn't neither if you're in the MGA,
With Atkins and Stan. Middlebrook to keep you in the way
Of growing mushrooms on a shelf but never on a tray.

The author, and well-wisher? Our highly esteemed printer, A. S. Maney, who was responsible for more of the light patter of the old Diary than I care to admit. (You'll agree his heart is in the right place?)

36. Here's wishing all MGA members a happy New Year. May we never see the like of 1955 again. Lovely weather for swimmers, but we were sinking fast. May all your summers be white—you'll do better that way.

37. I hope you have all made your resolutions. Here's mine: to increase our cropping from *2 lb. four times a year* (*shelves*) to 3·8 four times a year. It's quite simple. The results of some Class A experiments seem to suggest four independent ways of increasing production. Three of them apply to both shelves and trays; one to shelves only. The first three give improvements on our 2 lb. basic of 0·2, 0·24, and 0·34 respectively. By straight addition (non-cumulative) this means 2·78. The fourth application of " beyond all reasonable doubt " science would raise our shelf figure to 3·8. If the addition were cumulative the figure would be in the dream realm. And four times a year at that—well over 16 lb. a year. A resolution? Yes, but can it be done? That's *my* problem. *Yours* is—" What are the details of the improvements involved? " Better ask Littlehampton!

P.S. In 10 years' time I wouldn't be surprised if we're doing *2 lb. four times a year* (*shelves*)*!*

38. Here's a profound and appropriate statement: Mushroom growing is seriously complicated when one tries to get what the other fellow says he gets.

39. This will silence our Scientists for a day or two. In a Class A test (multi-replicate) a certain good-moisture-holding peat UNLIMED and normally wetted-up is placed on a number of trays. Other trays have the same UNLIMED wetted-up peat which has been passed through a Robust chopper at very low speed. Spawn is growing quickly and well in the machined trays but hardly at all in the non-machined. You-all, Mr. Flegg and the rest of you, you know the answer? I doubt it.

40. We're small-minded, lowly people, most of us who actually *grow* mushrooms. Perhaps we are too subservient because experience teaches us to be humble in the presence of the fickle mushroom. It should be good for us that every now and then Pundit Atkins comes along and tries to raise us to his own intellectual level. But is it? I often think in mushroom growing it's folly to be wise. In our ignorance we have defied a similar wise pundit and refused to turn out a compost

that was full almost to overflowing with a mould, diagnosed by said authority as White Plaster and condemned as useless. There were, however, some very strong spots of spawn growth which to our simple minds seemed to be holding their own. So far it has done 1·4 in 15 days. We shall stay in the " bliss " category.

41. We have evolved some sliding shutters for the roof vents of our new Handcrafts, using aluminium Dexion angle with Onazote for insulation. Somewhat expensive but pretty durable; nothing to rust, rot, or decay.

42. In Pinhead 26, I mentioned our poor cropping at Brayton from Sinden's short composting. A feature of our first phase was a uniformly dark, moist compost, smelling strongly of ammonia at filling. The same qualities have been achieved by an entirely different process and I don't like them. In my simple amateurish way I feel that it is wrong to have so much ammonia released and I can't see the point of forcing a lot of trouble just for the fun of trying to get rid of it. Another point. I hope I'm wrong, but from certain symptoms I am wondering to what extent La France may be connected with a process which involves this excessive release of ammonia. Am I sticking my neck out?

43. I hear that our by-product compost (spent, used, matured—what you will) produces better field crops if it is steamed before being spread on the land.

44. As a member of the Editorial Board of this Bulletin I am thinking of suggesting that all scientific notes and articles should be printed in red on a red background. The colour would warn the average practical grower of the danger of too much science and the fact that he couldn't read it would save him the mental effort of wading through a lot of stuff from which he would get nothing anyway. One could make out a good case to show that science in commercial mushroom growing leads to intolerable confusion and near-bankruptcy.

45. If the casing we are trying from local peat beds, at half the price of other peats, proves as good in general commercial use as it has been in several tests, I must see about obtaining a financial interest in the firm producing it!

46. Circumstances permit me to enlarge on the last sentence of Pinhead 44. Science, in one form or another (if not in all forms), can be a menace. If you want to save labour and fuel and increase your efficiency in heating generally, science has introduced and recommended the use of fully automatic controls. Fit automatic control and forget, the legend goes. I strongly implore you to do nothing of the kind. Why? Read what my insurance people say: " We would point out that automatic controls are only to be used to assist in the manual control of a boiler plant and should under no circumstances be left in complete control for long periods." A verbal estimate of " long periods " hints at supervision being necessary every 40 minutes or so. So you install automatic devices to carry you through the night without attention, on the strength of the claims of science and the instrument makers and boiler suppliers, and you then engage one or two night watchmen to sit

by the boiler to watch that the devices do not fail. It's fantastic. But who, you ask, is going to take any notice of the ultra caution of an insurance company? Well, I am. *Because it's happened to me.* At 5.45 one evening our automatic steam boiler (not the new one) was operating perfectly. By 8 p.m. it had collapsed and burned out. The water feed pump had failed to switch in, the warning bell failed to operate, but the stoker was left on. A large fire was thus kept burning in a dry boiler. The boiler became a glowing mass of red metal and we'd only just time to switch off the stoker when, for no apparant reason, the water pump suddenly switched on, and cold water cascaded down the internal surfaces of the hot raging metal. The water " flashed to steam " and my boilerman and I flashed to safety.

I hinted above that you might have to engage one or two night watchmen. One alone, you see, might be lulled to sleep by sheer boredom. Two could work in short shifts. (They'd probably have to if a faulty switch " flashed " off their pants!) Some saving might be made by providing a single watchman with an automatic vibrator in the seat of his arm chair. But no! On second thoughts the vibrator switch might fail . . . . . you still need the second watchman to vibrate the first.

47. Mushrooms, I understand, are again being flown from Ireland to the North of England in great numbers. The pilots of Aer Lingus, taking note of the fact, have re-named their Service "Aer Fungus."

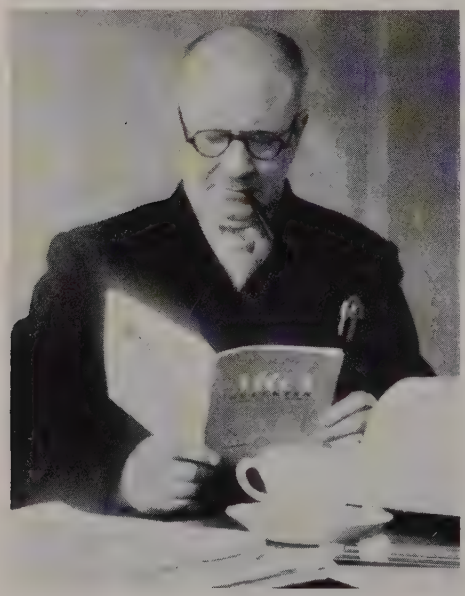
" . . . *tries to raise us to his own intellectual level.*" (*Item 40*).

NEW EXECUTIVE COMMITTEE MEMBERS

The only real newcomer to the MGA Executive Committee, following the Annual General Meeting, is Mr. J. A. Linfield for, in the case of Mr. Stanley Middlebrook, it is a return to the fold.

J. A. LINFIELD is Managing Director of that tremendous mushroom growing undertaking, Messrs. A. G. Linfield Ltd., of Thakeham, Pulborough, Sussex, and Messrs. A. G. Linfield (Sompting) Ltd. He is a member of the third generation of the firm, which has been associated with mushroom culture since 1889. Other business interests include rose growing and the raising of farm stock. Mr. Linfield is married and has three children.

STANLEY MIDDLEBROOK was the first to join the MGA. He served on the Executive for many years and was Chairman in 1948. He was first Editor of The Bulletin and its most controversial contributor ever since. Author for nine years of the Diary and now launched on the equally provocative Pinheads; a founder Director of the MRA. Pretends to have no patience with " scientists and pundits," yet is among the very first to try everything which Science suggests may be worthwhile. Grows on shelves but would turn over to trays to-day if he could find an economic reason for doing so. Tilts vigorously at current windmills but stands aghast when his comments are taken personally and to heart, for no one is more generous. Hobbies: argumentation, painting, music, motor cars, friendship and more argumentation—he excells at some of them (writes F.C.A.)



MEMBERSHIP LIST

Turner, D.A., Bretby House, Hurley, Atherstone, Warwick (omitted in error).

NEW MEMBERS

Bagnall, D. N. K., Overmist, The Avenue, Tadworth, Surrey.
Kavell, W. L., 199 Musters Road, West Bridgford, Nottingham.

(*Associate Members are in italics*)

E. H. PALFREY observes :

THE PAEDOGENETIC PHENOMENON

Once inside a house, it is the Phorid **fly** and Sciarid **fly** which multiply the damage. But the Cecid eschews flight, and relies on *paedogenesis.**

The Phorid and Sciarid larvæ fill up with food, quieten down and **have to** emerge as flies. Cecids **can,** but hardly ever seem to in mushroom houses. Instead this phenomenon called paedogenesis, which gives rise to larvæ from a larva, takes place. Our Cecids are white and mostly transparent, the older and fatter ones having a brownish-orange blob in the middle, of, we think, digesting food. The older ones are about 4 mm. long and move about only slowly. I collected six of the fattest Cecids I could off mushrooms and watched them under a low powered microscope, keeping them between glass slides held apart by thick paper. Three had pieces of mushroom to eat if they wanted, but they weren't interested. Two died of my clumsiness in moving them about, and four went through Paedogenesis. The following is a common account of what happened.

Seemingly contented the Cecid settled down and became quiet. Seen from on top, on the sides along two lines diametrically opposite, black headed pimples were formed at regular intervals, in line with the section " cracks."

Fig. 1. About twelve times normal size.

Coils of curdy white opaque substance having a mottled appearance were formed, and it seemed to be these which were organised into transparent torpedo-like bodies. Meanwhile the anchor process† was disappearing. There followed rhythmic movements of the formed coiled bodies inside, accompanied by what appeared to be a pumping movement of fluids. The whole became bloated, its surface turned darker to a brown-black iridescence, which on close examination showed a fairly systematic wrinkle pattern. There followed abundant activity in a considerable amount of fluid, the newly formed Cecids, their anchor processes then clearly seen, even doubling back to face about. It seemed that under the urgency and pressure of this movement the main carcase cracked, in each case just a very little at the tip of the " head " end. One by one over several hours the young Cecids emerged, and it seemed that a first peep at the world about caught their breath because they generally backed in again to get out on a second attempt, sometimes with much effort and difficulty. About six came out each time, each roughly half as long as the old Cecid, but much thinner, and started moving around energetically and eagerly. And behind them and of no interest to them, the parent carcase was left lifeless.

*More accurately, from a biological point of view, the word should be Parthenogenesis, from the Gr. *parthenos* (a virgin) and *genesis* (production) i.e. birth from a virgin.—Editor.

†The anchor process is the formation seen in Fig. 1 near the head; it is dark and definite, and quickly identifies a Cecid larvæ.

THIS MAY WELL CONCERN YOU

Quite recently a mushroom grower, selling direct to the public, had a visit from a Weights and Measures Inspector who carefully weighed every chip to make sure that the contents agreed with the weight given on the outside of the chip or chip cover. Fortunately no shortage was found.

This incident is given as a warning of the ever present danger to growers who market their produce under a given weight without taking the precaution of adding "As packed at farm" or "When packed" or something similar. The addition of these words gives growers complete indemnity with the Law and such a precaution is doubly important where—as in many cases—two or three days may elapse between the time of picking and the time when the produce is purchased by the public. As is well known mushrooms are prone to lose some weight.

CHLORIDE OF LIME—DACTYLIUM

The treatment of *Dactylium* on mushroom beds with chloride of lime was discovered by Mr. M. Swanik, of Snowcap Mushroom Farm, Wampum, Pa., U.S.A. It is very simple and effective. One can use the material just as it comes from the chemists.

Each infection as it appears must be treated by sprinkling the dry powder over the mildew area, not heavily but just enough to have some powder in the region where the *Dactylium* is growing. By no means put the powder on any part of the bed surface where no mildew is.

The chlorine gas given off kills the mildew (and the mushrooms) in the treated area without the powder having to come in contact with all the mildew. It will not injure mushrooms at any great distance from the treated area as we have found formaldehyde will do.

The great advantage of the treatment with chloride of lime is that the powder if carefully sifted over the infection does not dislodge the spores which are so easily air borne. A sifter top with fairly big holes can be used or the powder, which absorbs water readily and becomes moist, can be distributed with a flat wooden spatula. It is very corrosive to metal.

At first the task of treating all infected areas will seem very great, but if it is thoroughly done and all new infections treated the day they first appear, the disease can be completely under control in two weeks. We have seen very severe cases totally killed in such a short time. But you must get on the job every day and thoroughly.

JAMES W. SINDEN.

Since Dr. Sinden gave his lecture at Brighton we have received several enquiries about the use of chloride of lime for the elimination of *Dactylium* and we are grateful to Dr. Sinden for permission to reproduce the above letter.—Editor.

MUSHROOM SALES PUBLICITY SCHEME

Messrs. H. Mount & Sons Ltd., the makers of **Mount Mushroom Spawn,** are so convinced of the benefit of a **Publicity Scheme** such as the existing one, that they are going to contribute to the scheme :

ONE PENNY FOR EVERY CARTON OF MOUNT MUSHROOM SPAWN ON WHICH THE GROWER CONTRIBUTES ONE PENNY

They hope that **every Grower** will contribute to the Scheme and they will continue to add a label to all Invoices and Statements so that each Grower will know the exact amount due, should he wish to subscribe.

SOME EXPERIMENTS IN DENMARK*

C. RIBER RASMUSSEN

(x) 4·9 kilos/square metre=1 lb./square foot.

(xx) 24·1 kilos per square meter bed area equal to 310 kilos (662 lb.) per ton of fresh manure.

It will be seen that in both experiments, on shelves as well as in trays and irrespective of the casing soil used, the D-treatment has produced the highest yields ranging from 2·2 kilos to 8·2 kilos per square meter when compared with the control, equal to an increase of from about 13—82 per cent. If the D-treatment is compared with the best of the two gypsum treatments, the increased yields are ranging from about 12—29 per cent.

Moreover the table shows that in the summer experiment there was only a slight difference between the control A and the two gypsum treatments. In the wintertime, however, the gypsum treatments gave a considerable increase in yield compared with the control, which confirms that gypsum will improve a poorly prepared compost whereas a well prepared compost does not need gypsum.

Of the three casing soils tested, the b-soil (meadow) averaged a higher yield than the two clay soils, but it must be noted that the quality of the mushrooms was on an average better on the clay soils.

Comparing the yields between shelves and trays there was a slight tendency to lower yields from the trays, but the difference is only slight and not as prevalent as it is usually claimed by the growers. The cause for reduced yields when growing in trays on a commercial scale is without doubt due to insufficient ventilation particularly during the peak-heating but also through the cropping period.

In the experiments a set of non-peak-heated trays with all the treatments was compared with peak-heated composts and in case of treatment D showed an increase in yield of more than 40 per cent. in both experiments.

Conclusion:

Adding 4 kilos of sulphate of ammonia at stacking, and 15 kilos pure calcium carbonate at the first turning and 4 kilos superphosphate plus 15 kilos gypsum at the second turning per ton of fresh horse manure seems to increase the cropping yields significantly as compared with no supplements or compared with the amounts of gypsum generally used in the mushroom industry.

*Owing to circumstances outside the control of the Editor, the above was omitted from the article by C. Riber Rasmussen which described some Danish experiments. The article appeared in Bulletin No. 70 (October, 1955). The above should be read immediately after Table 4 on page 780.

MGA ANNUAL BUSINESS MEETING

The Annual Business Meeting of the MGA, for the purpose of the presentation of the accounts, will be held at the headquarters of the NFU, 45 Bedford Square, London, W.C.1, at 11.30 a.m., on Thursday, 24th January. All members are welcome.

I have been thinking

ABOUT THE MGA

By Dr. R. L. EDWARDS

I have been an honorary member of the MGA since 1946 : although I have never held any official post in the Association I think I have seen more of its career since then than anyone except F.C.A. Although the MGA and MRA were separate bodies they worked very closely together, and there must have been few occasions indeed when either of them asked the other for help in vain.

In the early years the emphasis in MGA was on the struggle for existence, against licences and controls on fuel, building materials, etc., and on help for members, including newcomers to the industry. This help for new growers was not favoured by all, but many of them would have started in any case and it was much healthier for the industry that they should start on the right lines. Some of these newcomers have since become members of the Executive Committee, and one has been its Chairman, so we should undoubtedly have been the losers if they had been discouraged. At the same time the MGA, mainly through its successive secretaries, did much to explain the risks and demands of the business to people who only saw the (then large) potential profits, and so discouraged many would-be growers who had little chance of success.

As time went on the militant campaign for recognition became less necessary, and the MGA turned to other fields. Refresher Courses and Trade Shows were organised, at first jointly with MRA and then independently. Area Meetings and Farm Walks were arranged, at which there were better opportunities for the friendly (and sometimes heated) discussions and informal mutual aid which have always been a feature of the MGA.

But the MGA has its moments of lighter entertainment, which turn up when least expected. One of the best was the occasion when Sherriffs (of "Punch") came to the Annual Lunch and drew caricatures of the Officers and Committee members. I was in the MGA office with Fred Atkins and Angus Watson when the drawings arrived and I shall never forget it. As we looked through them, every time we came to Fred's picture Angus started laughing, and every time we came to Angus, Fred did.

In the last year or two the MGA has changed its course. Commercially, the marketing of mushrooms has assumed increasing importance, and now demands nearly as much attention as growing them. Output is rising as many established growers extend their farms, and demand must be stimulated at least to keep pace. Even if all growers supported the spawn levy as they should, and with the other donations the Publicity Fund is all too small. Under these circumstances the inexpensive publicity given by news items, cookery experts and so on is quite invaluable, but in its very nature it is sensitive to any suggestion that it is inspired by commercial interests, and we should be foolish to

ask the Publicity Committee for a detailed account of this unofficial but vitally important aspects of its work. On the constructive side we should take a broad view of the publicity campaign and every member should make the fullest possible use of the various leaflets, etc., which are now available or in preparation. It may not be our own mushrooms that are sold as a result, but if, for example, the demand for mushrooms in London were doubled, every market in the country would feel the benefit, and the same consideration applies in a smaller way elsewhere.

The Association's dealings with officialdom have moved on from a struggle for existence to a fight for progress, first in the form of support for MRA, and now for research and experiment to replace the work which ended at Yaxley over a year ago. Not that there has been a complete standstill, for three of the Yaxley staff have been engaged on work which will bear fruit in due course. But the inherently leisurely progress of official bodies proves irksome to businessmen who are accustomed to taking their own decisions, taking them quickly, and acting on them at once.

Apart from this time interval, about which the MGA representatives concerned are making vigorous protests, there appears to be some concern about the nature of the work to be done at the new Institute.

Its Chairman has told us that it will be "fundamental" in nature and will not deal with *ad hoc* problems. This is a subject which has concerned me for the past ten years, and unlike most of the people concerned I have had a foot on each side of the fence. The new Institute is a *Crop* Research Institute, and the fundamentals of the mushroom crop are compost, casing, spawn, house management, prevention of attack by pests and diseases.

Within this very wide field the MGA through its Research Committee can and should ask for investigation of the problems it considers most pressing on a National scale. That is one aspect of the term "fundamental" which does not mean unpractical and is not unduly restrictive. The other implication of the term is that when the choice of problems for research has been made, the research workers' approach will be fundamental, which may mean that the experimental work will not seem very practical, although it will lead to the soundest result in the end. One advantage of the fundamental approach is that the results are of wider application than to the immediate problem.

However, I think when things do start to move we can rely on the combined knowledge, sense and enthusiasm of the MGA Sub-Committee and the Research Institute Board and Staff to see that the right problems are tackled in the right way. At the same time it would be most valuable to have mushrooms grown at the Experimental Stations, so that new methods can be tried, proved and demonstrated under commercial conditions.

What next? What new tasks lie ahead for the MGA? One possibility is the collection of statistics, of production, price trends, and costs of production.

Whatever the future, the MGA is very much alive, for which we should all be truly thankful.

LATEST PUBLICITY CONTRIBUTIONS

	£	s.	d.
P. C. Brown, Esq., Biddulph, Stoke-on-Trent	8	6	8
*H. Dowson & Co. Ltd., St. Andrew's Street, Newcastle-on-Tyne (Salesmen)	1	1	0
*C. Snowdon & Co. Ltd., Castlefolds Market, Sheffield (Salesmen)	2	6	7
†Messrs. H. Mount & Sons Ltd., Littlebourne, Canterbury (Spawn Makers)			

*Previous contributions already acknowledged

†Contributions from spawn merchants are not for publication

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The members of the MGA Executive Committee join the members of *The Bulletin* Editorial Board and the Editor in wishing you all a very happy and prosperous New Year.

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Atlas Basket Co. Ltd., Harpenden, Herts. (Basket Makers)

LONG TERM PUBLICITY

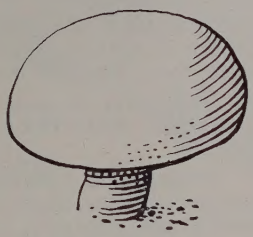
A party of twelve sixth form girls from the Askie Haberdashers' Girls School, Acton, visited The Dell Mushroom Farm, Ruislip Common, Middlesex, on 1st December, where they were shown round by Mr. and Mrs. A. J. Berry. The girls were accompanied by their tutor, Dr. Roth.

The party was shown over the farm and details of the growing methods were explained to them. Afterwards they were entertained to coffee and this was followed by a short talk, in which the best ways of selecting mushrooms when buying and the various ways of cooking mushrooms were explained to them. Each girl was also given a small pack of mushrooms to take away, together with MGA publicity leaflets and recipes. All the girls were taking a special biology and science course prior to going to universities in the New Year.

Commenting on the visit Mrs. Berry says, "Apart from the fact that most of these girls will eventually marry (and we hope, use mushrooms in their family menus) three hope to be doctors, two dieticians, two nurses and the rest in the science and domestic science world. We felt this might be quite a long term publicity effort to present mushrooms to them in several ways."

The Horse

the Mushroom



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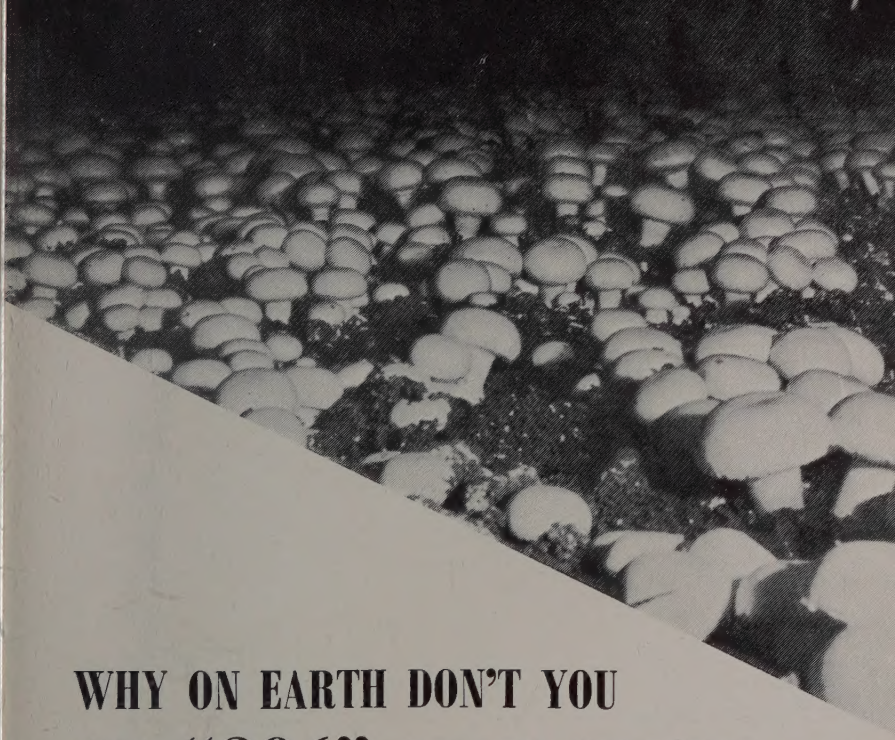

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